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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/789,042	02/27/2004	Kie Y. Ahn	1303.050US2	8328
21186	7590	09/05/2006	EXAMINER	
SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A. P.O. BOX 2938 MINNEAPOLIS, MN 55402			RICHARDS, N DREW	
			ART UNIT	PAPER NUMBER
			2815	

DATE MAILED: 09/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/789,042	AHN ET AL	
	Examiner	Art Unit	
	N. Drew Richards	2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 July 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-45 is/are pending in the application.
- 4a) Of the above claim(s) 20-45 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>5/30/06</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election of Species I, claims 1-19, is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 1-6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites a film disposed on the substrate, the film having a predetermined amount of lanthanum and aluminum on a surface on which the film contacts. It is indefinite how the film can have a predetermined amount of lanthanum and aluminum on a surface on which the film contacts. The lanthanum and aluminum are only contained in the film itself, thus this claim recites the film having a surface which contacts the film. How can the film contact itself? It is suggested that this limitation be amended to recite "in contact with the substrate" to specify that the predetermined amount of lanthanum and aluminum contact the substrate instead of contacting itself.

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4. With regards to claims 1-19, the examiner had to assume what the product would be by the process claimed. For example, in claim 1 it was assumed that the product was a film containing LaAlO_3 . The claim that it was "atomic layer deposited" was not considered to have full patentable weight. A "product by process" claim is directed to the product per se, no matter how actually made, MPEP 2113 "Product-by-Process Claims," In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90; In re Marosi et al, 218 USPQ 289; and particularly In re Thorpe, 227 USPQ 964, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. Claims 1, 2, 5, 6, 12, 13, 16 and 17 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,365,470 to Maeda.

With regards to claims 1 and 12, Maeda illustrates in figures 1A-2C (entire document), particularly figure 2C, a substrate or body region 1; and a film 7 disposed on the substrate, the film containing LaAlO_3 (col. 3, lines 60-63). The film inherently has a predetermined amount of lanthanum and aluminum on a surface contacting the substrate or in contact with the body region. It is noted that a "predetermined amount" does not positively recite any specific amount. It is inherent in the semiconductor industry that a device, and the process of forming it, will be formed many times. Thus, after an initial formation of Maeda's device, whatever amount of lanthanum and aluminum contacts the surface becomes a "predetermined" amount every time thereafter that the device is formed.

Regarding claims 2 and 13, Maeda discloses in col. 3, lines 60-63 and claim 12 the film includes Al_2O_3 and La_2O_3 .

Regarding claims 5, 6, 16 and 17, Maeda discloses in col. 3, lines 34-35, the film 7 has a thickness of 1 nm to 100nm (10 \AA to 1000 \AA). $T_{\text{eq}} = (3.9/K) t$. U.S. Patent No. 6,642,573 to Halliyal et al. ("Halliyal") discloses in Table I that LaAlO_3 has a value of 25. Therefore, $T_{\text{eq}} = (3.9/25) 10 \text{ \AA} = 1.56 \text{ \AA}$ to operate the transistor at the lowest voltage.

7. Claims 1, 3, 12 and 14 are rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent Application Publication No. 2003/0032270 to Snyder et al. ("Snyder").

With regards to claims 1 and 12, Snyder illustrates in figures 2-9 (entire document), particularly figure 2, a substrate or body region 210; and an amorphous film 250 disposed on the substrate, the film containing LaAlO_3 (paragraph 28). The film inherently has a predetermined amount of lanthanum and aluminum on a surface contacting the substrate or in contact with the body region. It is noted that a "predetermined amount" does not positively recite any specific amount. It is inherent in the semiconductor industry that a device, and the process of forming it, will be formed many times. Thus, after an initial formation of Snyder's device, whatever amount of lanthanum and aluminum contacts the surface becomes a "predetermined" amount every time thereafter that the device is formed.

8. Claims 1, 4, 7-12, 15, 18 and 19 is rejected under 35 U.S.C. § 102(e) as being anticipated by Halliyal.

With regards to claims 1 and 12, Halliyal illustrates in figures 1-8 (entire document), particularly figure 1, a substrate or body region 16/18; and a film 26 disposed on the substrate, the film may contain a high-K dielectric LaAlO_3 (col. 5, lines 17-27 and Table I). A high-K dielectric material is one having a K value of 20 or more (col. 6, lines 14-16). The film inherently has a predetermined amount of lanthanum and aluminum on a surface contacting the substrate or in contact with the body region. It is noted that a "predetermined amount" does not positively recite any specific amount. It is inherent in the semiconductor industry that a device, and the process of forming it, will be formed many times. Thus, after an initial formation of Halliyal's device, whatever

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amount of lanthanum and aluminum contacts the surface becomes a “predetermined” amount every time thereafter that the device is formed.

Regarding claims 4 and 15, Halliyal discloses in Table I the film exhibits a dielectric constant of 25.

With regards to claim 7, Halliyal illustrates in figures 2-8 (entire document), particularly figure 2 a body region 18 between first and second source/drain regions 12/14 in a substrate 16; a film 42 on the body region between the first and second source/drain regions, the film containing LaAlO_3 (Table I) and a gate 46 coupled to the film. The tunnel dielectric layer 42 can be a high-K dielectric material (col. 5, lines 39-41) and the ONO structure 26 can contain a high-K dielectric material (col. 5, lines 55-59). The film inherently has a predetermined amount of lanthanum and aluminum on a surface contacting the substrate or in contact with the body region. It is noted that a “predetermined amount” does not positively recite any specific amount. It is inherent in the semiconductor industry that a device, and the process of forming it, will be formed many times. Thus, after an initial formation of Halliyal’s device, whatever amount of lanthanum and aluminum contacts the surface becomes a “predetermined” amount every time thereafter that the device is formed.

Note: “the film being formed by atomic layer deposition including: pulsing a lanthanum containing precursor into a reaction chamber containing a substrate; pulsing a first oxygen containing precursor into the reaction chamber; pulsing an aluminum containing precursor into a reaction chamber; and pulsing a second oxygen containing

precursor into the reaction chamber” is a product-by-process limitation (see above).

Additionally, claims 8-10 are product-by-process claims.

Regarding claims 11, 18 and 19, Halliyal illustrates in Fig. 2 a floating gate 44 situated between the body region 18 and the gate 46; and a floating gate dielectric 26 disposed on the floating gate, separating the floating gate and the gate, the floating gate dielectric containing LaAlO_3 (Table I).

Response to Arguments

9. Applicant's arguments filed 7/10/06 have been fully considered but they are not persuasive.

Applicant has argued that none of the prior art references applied (Maeda, Snyder et al. or Halliyal et al.) teach an atomic layer deposited LaAlO_3 film having a predetermined amount of lanthanum and aluminum on a surface on which the film contacts. Applicant argues that an atomic layer deposited LaAlO_3 film is a structure different from LaAlO_3 films formed by other means. Applicant points to page 11 lines 23-28 of their specification as apparently showing that the ALD layers are different structures than layers formed by other means. Applicant argues that the self-limiting growth provides uniformity and conformality and that an ALD film is structured as monolayers built up to a final thickness.

First, it is noted that merely reciting “an atomic layer deposited film” in the claims does not necessitate that the atomic layer deposition method followed is the specific one used by applicant in their specification. Many variables and modifications exist in

atomic layer deposition processes that may, when used to form the LaAlO_3 film, result in differences in film composition and structure. Thus, merely reciting an atomic layer deposition film does not necessitate any particular structure from any particular ALD process but instead encompasses all structures that could be formed by any ALD deposition process.

Second, applicant's mere allegation that the ALD process provides uniformity and conformality and the fact that it relies upon monolayers built up to a final thickness in no way show that the final structure of the layer is different from LaAlO_3 film's formed by other means. Applicant has not provided any facts or evidence as proof that the LaAlO_3 film formed by ALD has a different structure than those formed by other methods. Further, please note that any evidence provided will need to prove that ALD LaAlO_3 film's necessarily have a different structure every time than those formed by other methods. That is, it must be shown that ALD LaAlO_3 film's cannot possibly have the same structure as those formed by other methods. At this point, no evidence of a structural difference has been provided and thus applicant's arguments that the "product-by-process" limitation provides a different structure are not persuasive.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to N. Drew Richards whose telephone number is (571) 272-1736. The examiner can normally be reached on Monday through Friday from 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Parker can be reached on (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



N. DREW RICHARDS
PRIMARY EXAMINER